

3.8 Air Quality

3.8.1 Regulatory Setting

Air quality in Utah is regulated by U.S. Environmental Protection Agency (EPA) at the federal level and by the Utah Department of Environmental Quality, Division of Air Quality (UDAQ), at the state level. Transportation-related emissions are forecasted by the two metropolitan planning organizations (MPOs) serving the region: the Wasatch Front Regional Council (WFRC) in Salt Lake County and the Mountainland Association of Governments (MAG) in Utah County.

3.8.1.1 Pollutants of Concern

Criteria Air Pollutants

Part of this assessment focuses on the “criteria air pollutants” for which the EPA has established national ambient air quality standards (NAAQS). Criteria air pollutants have the potential to cause health problems and are partially associated with transportation-related emissions: carbon monoxide (CO), particulate matter (PM), ozone (O₃), nitrogen oxides (NO_x), and volatile organic compounds (VOCs). This assessment also considered lead (Pb) as a potential air pollutant of concern because of its potential to be re-suspended from lead-containing contaminated soil during construction activities. The specific concerns associated with these criteria air pollutants and their typical sources of emission are described below.

- CO, which is emitted by vehicle engines, reduces the amount of oxygen carried in the human bloodstream.
- PM falls into one of two categories: PM with a diameter of 10 microns or less (PM₁₀) and PM with a diameter of 2.5 microns or less (PM_{2.5}). PM_{2.5} is part of PM₁₀, but the two are regulated independently. There are two categories of particulate emissions from mobile sources: primary and secondary.
- Primary particulate emissions are those emitted from vehicle tailpipes, brake wear, decomposition of rubber tires, and road dust stirred up by moving vehicles.
- Secondary particulate emissions result from chemical reactions in the atmosphere involving oxides of sulfur (SO_x) and NO_x emitted from vehicle tailpipes as gaseous pollutants.
- Ozone is a secondary pollutant formed when precursor emissions of NO_x and VOCs react in the presence of sunlight. O₃ is a major component of photochemical smog.
- NO_x is composed mainly of nitric oxide (NO) and nitrogen dioxide (NO₂). NO is formed in high-temperature combustion processes, such as within internal combustion engines. When NO reaches the atmosphere, most of it oxidizes and produces NO₂, the brownish component of photochemical smog.
- VOCs, the reactive component of hydrocarbon emissions, are compounds of carbon and hydrogen that react chemically in the atmosphere to produce NO₂ and O₃. Principal sources of VOCs are vehicle exhaust emissions and the evaporation of gasoline from fuel tanks, fuel injectors, and carburetors.
- Sulfur dioxide (SO₂) is a combustion product formed from sulfur in the fossil fuels used by construction equipment and by vehicles traveling along roadways. High airborne concentrations of SO₂ can cause respiratory problems. SO₂ emissions from construction equipment and vehicles are expected to steadily decrease in the future as a result of EPA’s nationwide restrictions on sulfur content in fuel.
- Lead can be released during construction from contaminated soils that contain historic lead deposits (i.e., from periods before lead was phased out of gasoline). High airborne concentrations of lead can cause a range of health effects (especially in children), including behavioral problems and learning disabilities.

Mobile-Source Air Toxics

The federal Clean Air Act (CAA) identified 188 air toxics, also known as hazardous air pollutants. Most air toxics originate from human-generated sources, including on-road mobile sources, non-road mobile sources (e.g., airplanes), area sources (e.g., dry cleaners), and stationary sources (e.g., factories or refineries). The EPA has assessed this expansive list of 188 air toxics and identified a group of 21 as mobile-source air toxics (MSATs), which are set forth in an EPA final rule, *Control of Emissions of Hazardous Air Pollutants from Mobile Sources*, published in February 2007 as 40 CFR Parts 59, 80, 85, and 86. MSATs are compounds emitted from highway vehicles and non-road equipment. Some MSAT compounds are present in fuel and are emitted when the fuel evaporates or passes through the engine unburned. Other MSATs are emitted from the incomplete combustion of fuels or as secondary combustion products. Metal MSATs also result from engine wear, erosion of brake linings and tires, or impurities in oil or gasoline. Based on EPA's research, FHWA has identified a subset list of six "priority MSATs." These are described below:

- Benzene is characterized as a known human carcinogen.
- The potential carcinogenicity of Acrolein cannot be determined because the existing data are inadequate for an assessment of human carcinogenic potential for either the oral or inhalation route of exposure.
- Formaldehyde is a probable human carcinogen based on limited evidence in humans and sufficient evidence in animals.
- 1,3-butadiene is characterized as carcinogenic to humans by inhalation.
- Acetaldehyde is a probable human carcinogen based on an increased incidence of nasal tumors in male and female rats and laryngeal tumors in male and female hamsters after inhalation exposure.
- Diesel exhaust (DE) is likely to be carcinogenic to humans by inhalation from environmental exposures. DE, as it is reviewed in this document, is the combination of diesel particulate matter (DPM) and DE organic gases. DE also causes chronic respiratory effects. Prolonged exposure may impair pulmonary function and could produce symptoms such as coughing, phlegm, and chronic bronchitis. Exposure relationships have not been developed from these studies.

3.8.1.2 National Ambient Air Quality Standards

NAAQS are set by the EPA and have been established as the official ambient air quality standards for Utah. These standards include both primary standards to protect public health and secondary standards to protect public welfare (e.g., protecting property and vegetation from the effects of air pollution). Table 3.8-1 lists the NAAQS. The primary and secondary standards set by the EPA are the same, with the exception of CO, for which no secondary standard has been identified.

Table 3.8-1: National Ambient Air Quality Standards

Pollutant	National (EPA) Standard ^a	
	Primary	Secondary
Lead (Pb)		
Quarterly Average	1.5 µg/m ³	1.5 µg/m ³
Particulate Matter (PM₁₀)		
Annual arithmetic mean	50 µg/m ³	50 µg/m ³
24-hour average	150 µg/m ³	150 µg/m ³
Particulate Matter (PM_{2.5})		
Annual arithmetic mean	15 µg/m ³	15 µg/m ³
24-hour average	35 µg/m ³	35 µg/m ³

Table 3.8-1: National Ambient Air Quality Standards - continued

Pollutant	National (EPA) Standard ^a	
	Primary	Secondary
Carbon Monoxide (CO)		
8-hour average	9 ppm	No standard
1-hour average	35 ppm	No standard
Ozone (O₃)		
8-hour average	0.075 ppm	0.075 ppm
Nitrogen Dioxide (NO₂)		
Annual average	0.05 ppm	0.05 ppm

Notes: Annual standards are never to be exceeded. Short-term standards are not to be exceeded more than one calendar day per year, with the following exceptions. Compliance with the 8-hour ozone standard is based on the 3-year average of the 4th-highest daily maximum concentration measured at any monitor. Compliance with the 24-hour PM_{2.5} standard is based on the 3-year average of the 98th-percentile average of population-based monitoring locations.

ppm = parts per million

µg/m³ = micrograms per cubic meter

^a Primary standards are set to protect public health. Secondary standards are based on other factors (e.g., protecting crops and materials, avoiding nuisance conditions).

3.8.1.3 Air Quality Attainment Status

The CAA requires that all areas with violations of the NAAQS be designated nonattainment areas (i.e., out of compliance with established air quality standards). In nonattainment areas, a state implementation plan (SIP) must be developed by the state air agency and approved by the EPA that identifies control strategies and emission budgets for bringing the region back into compliance with the NAAQS for the respective pollutant. Maintenance areas are areas that have been in violation of the NAAQS and were originally designated as nonattainment areas, but are now meeting the NAAQS. For an area to be redesignated as maintenance, the state agency is required to prepare a maintenance plan to demonstrate that the NAAQS have been met and that regional emissions will be controlled sufficiently to ensure that violations of the NAAQS will not reoccur.

Table 3.8-2 lists the current attainment area status for each county and major municipality within the study area.

Table 3.8-2: Attainment Area Status for Project Area

Areas	Status	Pollutants
Provo City Limits	Maintenance area	CO within Provo city limits.
Utah County	Moderate nonattainment area (entire county)	Particulate matter (PM ₁₀)
Salt Lake City Metropolitan Area	Maintenance area	CO within the city limits of Salt Lake City.
Salt Lake County	Moderate nonattainment area (entire county)	Particulate matter (PM ₁₀)

Sources: Utah Department of Environmental Quality, Division of Air Quality 2004b; U.S. Environmental Protection Agency 2004.

As described later in this section, on December 18, 2007 UDAQ submitted its recommendation that the majority of Salt Lake County and the majority of Utah County should be re-designated as distinct PM_{2.5} areas. Furthermore, as also described later in Section 3.8.2.2, it is likely the Wasatch Front counties will eventually be re-designated as ozone nonattainment areas as a result of EPA's recent revision of the 8-hour NAAQS for ozone. However, those re-designations will not affect Transportation Conformity determinations and National Environmental Policy Act (NEPA) environmental documents for several years. Therefore, for this EIS the study area was assumed to be a current attainment area for both PM_{2.5} and ozone.

Particulate Matter Less Than 2.5 Microns in Diameter (PM_{2.5})

On December 18, 2006, EPA revised the 24-hour PM_{2.5} standard from 65 micrograms per cubic meter (µg/m³) to 35 µg/m³. An area will meet the revised 24-hour standard if the 98th percentile of 24-hour PM_{2.5} concentrations in a year (averaged over 3 years) is less than or equal to the 35 µg/m³ standard. By December 2007, the State of Utah will make recommendations for areas to be designated attainment (meeting the standard) and nonattainment (exceeding the standard). EPA intends to make official attainment and nonattainment designations by December 2008, and those designations would become effective in April 2009.

It is anticipated that portions of Salt Lake and Utah counties will be designated as non-attainment areas under the revised PM_{2.5} standard (Utah Division of Air Quality 2006b). If these areas are designated as non-attainment areas for PM_{2.5}, WFRC and MAG will need to demonstrate that projects such as the I-15 project meet the PM_{2.5} project-level conformity requirements one year after the effective date of non-attainment designations, which will be April of 2010 (i.e., they are included in a conforming long-range transportation plan and transportation improvement program, and they have met the hot spot requirements).

Under the transportation conformity rule, PM_{2.5} hot spot analyses are required for "projects of air quality concern". A new highway project could be considered a "project of air quality concern" if it is expected to carry traffic volumes of 125,000 vehicles per day, with 8% or more truck traffic (that is, 10,000 trucks per day). Traffic volumes south of US-6 (Spanish Fork Exit 258) are projected to be 110,500 vehicles per day or less while volumes from US-6 to the north will exceed 125,000 vehicles per day.

A project-level conformity determination is required for the first federal approval action after the 1-year grace period for new non-attainment areas expires, which is expected to be in April 2011 for PM_{2.5} (project-level conformity requirements already apply in the I-15 project area for CO and PM₁₀, and the Record of Decision for the I-15 project will include a project-level conformity determination for these two pollutants). Since additional federal approvals for this project are expected after April 2011, conformity will eventually apply to this project (assuming that the area is designated non-attainment for PM_{2.5}), and the U.S. Department of Transportation will comply with whatever PM_{2.5} conformity requirements apply at that time.

Even though transportation conformity does not currently apply for PM_{2.5}, and the U.S. Department of Transportation will not be making a conformity determination for PM_{2.5} as part of this EIS, the following discussion generally follows the approach described in the March 29, 2006 EPA and FHWA guidance, *Transportation Conformity Guidance for Qualitative Hot-spot Analysis in PM_{2.5} and PM₁₀ Non-attainment and Maintenance Areas*. At this point, FHWA has not released guidance on how to address the revised PM_{2.5} standard in NEPA documents.

At the national level, the EPA has established several control programs that will reduce emissions from most major sources of PM_{2.5} and its precursors. The EPA's Tier 2 light-duty vehicle regulations, 2007 heavy-duty vehicle standards, and control of the sulfur content of fuels are expected to reduce motor vehicle emission rates between 2005 and the expected opening year of the project. The EPA's May 2004 non-road engine regulations (<http://www.epa.gov/nonroad-diesel/2004fr/420f04032.pdf>) will take effect starting in 2008 and will reduce PM and NOx emissions from these vehicles by 90% by 2030. In March 2007, the EPA proposed new regulations to reduce locomotive emissions of PM by 90% and NOx by 80% (<http://www.epa.gov/otaq/locomotv.htm>). Regional programs to reduce visible air pollution coordinated by an interstate planning group known as the Western Regional Air Partnership will also have beneficial impacts on ambient PM_{2.5} concentrations.

Regional PM₁₀ modeling for conformity by WFRC and MAG shows similar trends for mobile source emissions. Tables C-12a and C-12b of WFRC's conformity documentation dated May 31, 2007 show declines in vehicle emission rates that largely mirror the national trends; when growth in regional vehicle miles traveled (VMT) is taken into account, NOx emissions will decline throughout the planning period, while PM₁₀ emissions will increase slightly between 2015 and 2030 (although levels remain well below the applicable emission budgets set to prevent violations of the PM₁₀ air quality standards) (http://wfrc.org/cms/publications/Adopted_2007-2030_RTP/Appendix%20C%20-%20Air%20Quality%20Conformity.pdf). MAG's conformity documentation dated April 2007 shows similar trends in emission rates and total PM₁₀ and NOx emissions (http://www.mountainland.org/Transportation_Plans/2007_Regional_Transportation_Plan/Document/Conformity%20Determination.pdf).

8-Hour Ozone

The Wasatch Front region has been in attainment with ozone standards since EPA revoked the 1-hour standard in 2005 (the region had always complied with the 8-hour ozone standard). On March 12, 2008, EPA revised the 8-hour ozone standard downward. Measure 8-hour ozone concentrations in many Wasatch Front counties exceed the new NAAQS standard, so it is likely portions of the Wasatch Front counties will eventually be re-designated as ozone nonattainment areas. EPA and UDAQ are expected to complete the following administrative process to re-designate the region to nonattainment (Bob Clark personal communication):

- March 2009. UDAQ submits its recommendation to EPA to re-designate the Wasatch Front counties.
- March 2010. EPA finalizes the re-designation
- 2011. WFRC and MAG develop their triennial emission inventories, and specify motor vehicle emission budgets for ozone precursors.
- 2012. Federally-funded highway projects in the Wasatch Front counties must satisfy Transportation Conformity for ozone.
- 2013. UDAQ submits the revised State Implementation Plan to EPA.

The NEPA process for the I-15 project will be completed before 2012, which is the starting date after which projects must satisfy Transportation Conformity for ozone. Therefore, the Transportation Conformity analysis completed for this EIS was done assuming the region is an attainment area for ozone.

3.8.1.4 Transportation Conformity Regulations

The Transportation Equity Act (TEA-21) and the CAA Amendments require that all regionally significant highway and transit projects in air quality nonattainment and maintenance areas come from a conforming transportation plan and transportation improvement program. A conforming plan is one that has been analyzed regionally for emissions of controlled air pollutants and meets the requirements of 40 CFR Part 93. Transportation plans, programs and projects are said to conform if they would not result in any of the following:

- new violations of the NAAQS;
- increases in the frequency or severity of existing violations of the NAAQS; and
- delays in attainment of the NAAQS.

For any given proposed highway project, these requirements are generally demonstrated by a two-step process, which must be described in the NEPA environmental document for the proposed project. A regional (mesoscale) air quality assessment is conducted to demonstrate two requirements:

- The combined traffic-related emissions from within the entire nonattainment area (including emissions from the proposed project) are included in each MPO's conformity regional emissions analysis.
- The combined emissions from within the nonattainment area are less than the allowable emission budgets set by the SIP, or if there is no SIP, comply with the interim emissions tests prescribed by the federal conformity regulations.

In addition, a project-level (microscale) air quality assessment (also called a *project-level hot spot analysis*) is conducted to evaluate short-term CO and PM concentrations adjacent to the I-15 corridor.

3.8.1.5 Federal Mobile-Source Emission Rules

In addition to the criteria pollutants for which there are NAAQS, EPA also regulates air toxics. Most air toxics originate from human-made sources, including on-road mobile sources, non-road mobile sources (e.g., airplanes), area sources (e.g., dry cleaners), and stationary sources (e.g., factories or refineries). MSATs are a subset of the 188 air toxics defined by the CAA. MSATs are compounds emitted from highway vehicles and non-road equipment. Some toxic compounds are present in fuel and are emitted into the air when the fuel evaporates or passes through the engine unburned. Other toxics are emitted from the incomplete combustion of fuels or as secondary combustion products. Metal air toxics also result from engine wear or impurities in oil or gasoline.

EPA is the lead federal agency for administering the CAA and has specific responsibilities for determining the health effects of MSATs. On March 29, 2001, EPA issued the Final Rule on Controlling Emissions of Hazardous Air Pollutants from Mobile Sources (66 Federal Register 17229). In its rule, EPA examined the impacts of existing and newly promulgated mobile-source control programs, including its reformulated gasoline program, its national low-emission vehicle standards, its Tier 2 motor vehicle emissions standards and gasoline sulfur-control requirements, and its proposed heavy-duty engine and vehicle standards and on-highway diesel fuel sulfur-control requirements. Between 2000 and 2020, FHWA projects that, even with a 64% increase in VMT, these programs will reduce on-highway emissions of benzene, formaldehyde, 1,3-butadiene, and acetaldehyde by 67% to 76% and reduce on-highway diesel particulate emissions by 90%.

In February 2007, EPA issued a final rule to reduce hazardous air pollutants from mobile sources. The final standards will lower emissions of benzene and other air toxics in three ways: 1) by lowering the benzene content in gasoline, 2) by reducing exhaust emissions from passenger vehicles operated at cold temperatures (under 75°F), and 3) by reducing emissions that evaporate from, and permeate through, portable fuel containers. Under this rule, EPA expects that new fuel benzene and hydrocarbon standards for vehicles and gas cans will reduce total emissions of MSATs by 330,000 tons in 2030, including 61,000 tons of benzene. As a result, new passenger vehicles will emit 45% less benzene, gas cans will emit 78% less benzene, and gasoline will have 38% less benzene overall.

3.8.1.6 State Regulations

UDAQ is responsible for the permitting of air pollutant sources and enforcement of emissions standards to satisfy NAAQS requirements. UDAQ is also responsible for coordinating with the EPA to specify nonattainment areas and preparing the SIP and maintenance plans. As part of those plans, UDAQ is responsible for developing emission budgets for future years to ensure future compliance with the NAAQS.

3.8.1.7 Local Air Quality Jurisdictions

The MPOs are responsible for periodically conducting transportation conformity analyses to demonstrate that the combined regional transportation projects conform to the emission tests specified by the conformity rule. For the proposed project, the two MPOs—MAG for Utah County and WFRC for Salt Lake County—conduct the regional conformity analyses, and FHWA issues the conformity determination as part of the NEPA documentation. Both the regional (mesoscale) evaluation completed by the MPOs and the project-level (microscale) evaluations completed for the NEPA document for individual projects are used to help determine whether the proposed project would meet the conformity requirements of the Clean Air Act.

3.8.2 Affected Environment

This section describes the existing conditions for climate within the study area, current air quality regulatory setting, and existing concentrations of key air pollutants at representative monitoring stations operated by the UDAQ, along the I-15 corridor. Information related to existing conditions for air quality and climate was obtained from the following sources:

- Climatological data for the study area were obtained from the website for the Western Regional Climate Center (WRCC) (2004).
- Data for historical air quality monitoring were obtained from the website for UDAQ (2004a).
- Information for air quality nonattainment area status was obtained from the website for UDAQ (2004b).

3.8.2.1 Climate

The study area is located within the Wasatch Front region of Utah. The northern part of the study area includes portions of the metropolitan area of South Salt Lake County, which is bordered on the east by the Wasatch Range. The I-15 corridor crosses the Utah County/Salt Lake County line at the Traverse Mountains, then drops in elevation to the Salt Lake City metropolitan area. Climate in the area is influenced by the altitude of the study area, the Wasatch Range, and Great Salt Lake. Annual average climatological data are listed in Table 3.8-3 for representative monitoring stations.

Table 3.8-3: Climatological Data for Project Area

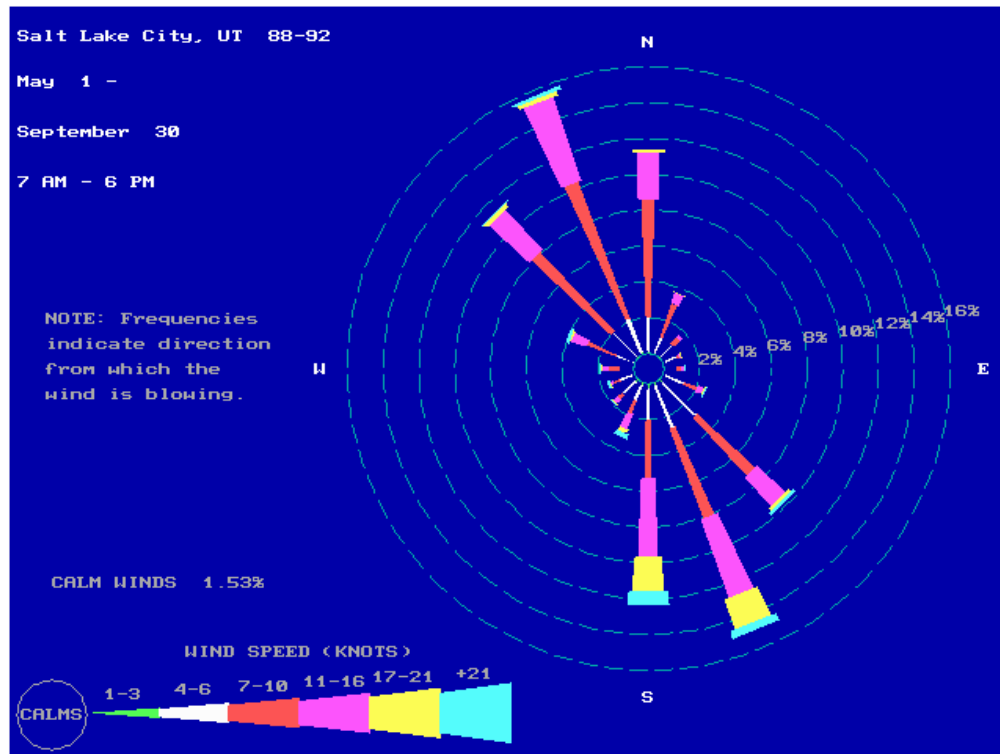
Station	Average Daily Maximum Summer Temperature	Average Daily Minimum Winter Temperature	Annual Average Precipitation
Provo, UT	92°F—August	21°F—January	21.1 inches
Cottonwood (Holladay, UT)	90°F—August	22°F—January	23.9 inches

Source: Western Regional Climate Center 2004

Temperature inversions occur frequently in the Wasatch Front region, particularly between November and February, although inversions occur during summer as well. Temperature inversions occur an average of 115 days per year at Salt Lake City (Utah Department of Environmental Quality, Division of Air Quality, 1997). Inversions are responsible for air stagnation problems that often occur during the cold winter months. Under typical atmospheric conditions, warm air near the ground surface rises and is replaced by cooler air, thus allowing air circulation that disperses ground-level air pollutants. However, under temperature inversion conditions, stable high-pressure weather systems trap cold air near the surface. Very little circulation occurs, so pollutant concentrations build up near the ground surface. In the Salt Lake City area, the stagnant air layers caused by temperature inversions are generally confined to the valley floors.

Figure 3.8-1 shows the wind rose for Salt Lake City (EPA 2008). The wind rose shows the annual frequency by which the wind blows from the listed direction, and the average wind speeds for wind blowing from that direction. Prevailing winds at Salt Lake City are from the north-northwest or the south-southeast, which matches the generally north-south orientation of the I-15 alignment within the study area.

Figure 3.8-1: Wind Rose for Salt Lake City



3.8.2.2 Historical and Existing Ambient Air Pollutant Concentrations

UDAQ operates ambient air quality monitoring stations throughout the region to monitor air pollutant concentrations; comparisons are then made to the allowable NAAQS, described below. For this assessment, recent historical monitoring data were evaluated for key air pollutants (CO, O₃, PM₁₀, and PM_{2.5}) at representative monitoring locations within the study area.

- North Provo (1355 North 200 West, Provo City, Utah). This station monitors CO, O₃, PM₁₀, and PM_{2.5}.
- Orem (1580 South State Street, Orem, Utah). This station monitors CO.
- Lindon (50 North Main Street, Lindon, Utah). This station monitors PM₁₀ and PM_{2.5}.
- Herriman (5600 West 12950 South, Herriman, Utah). This station monitors O₃.
- Cottonwood (5715 South 1400 East, Holladay, Utah). This station monitors CO, O₃, PM₁₀, and PM_{2.5}.
- Magna (2935 South 8660 West, Magna). This station monitors PM₁₀.
- Hawthorne (1675 South 600 East, Salt Lake City). This station monitors CO, PM₁₀, and PM_{2.5}.

Air pollutant concentrations in the study area have generally decreased since the early 1990s, and exceedances of the NAAQS are now rare despite steady increases in regional population and motor vehicle travel (Utah Division of Air Quality 2007). A portion of this improvement has resulted from the shutdown of some major industrial plants in the area (e.g., shutdown of the Geneva Steel Plant). However, most of the improvement has resulted from reductions in emissions from operating industrial facilities due to ongoing UDAQ regulations, as well as steady reduction of on-road vehicle exhaust emissions due to the EPA's ongoing motor vehicle emission programs. Historical increases in the amount of regional VMT have been more than offset by the historical improvement in emissions from each individual vehicle.

Measured CO concentrations for the period 2000–2003 are listed in Table 3.8-4. There were no violations of the NAAQS during that period at any of the local monitoring stations. Measured O₃ concentrations for the period 2000–2003 are listed in Table 3.8-5. During that period, there was one exceedance of the NAAQS, at the Cottonwood station. That single exceedance does not constitute a violation of the NAAQS, because the standard is based on the 3-year average of the 4th-highest daily concentration in any given year at any given location.

Historical ozone concentrations are listed in Table 3.8-5. There were no historical exceedances based on the 8-hour NAAQS in place before March 2008, but the most recent ozone concentrations exceed the new 8-hour NAAQS enacted in March 2008. It is likely the Wasatch Front counties will re-designated as ozone no attainment areas starting in 2010, and starting in 2012 federally-funded highway projects will be required to conduct Transportation Conformity assessments for ozone.

Measured PM₁₀ concentrations at monitoring stations along the I-15 corridor for the period 2001–2005 are listed in Table 3.8-6. There were two exceedances of the NAAQS during that period at the Lindon station. Those exceedances do not constitute a violation of the NAAQS, because the standard is based on the 2nd-highest daily occurrence in any one year at any given location.

Measured PM_{2.5} concentrations for the period 2001–2005 at the monitoring stations within the I-15 corridor are listed in Table 3.8-7. There were multiple exceedances of the new PM_{2.5} NAAQS at each of the monitoring stations along the I-15 corridor. Violations of the NAAQS are based on the 3-year average of the 98th-percentile concentrations. The measured concentrations constitute a violation of the NAAQS. As a result, on December 18, 2007 UDAQ submitted their formal recommendation to the EPA. They recommended the majority of Salt Lake County and the majority of Utah County be re-designated as two distinct PM_{2.5} nonattainment areas. The re-designations will take effect in April 2009. Starting in April 2010 conformity analyses for transportation projects must begin to account for the upcoming PM_{2.5} nonattainment areas.

Table 3.8-4: Carbon Monoxide Air Quality Monitoring Data

Station	Year	Highest 8-Hour Value (ppm)	Number of Days of Exceedances above NAAQS
North Provo	2003	3.0	0
	2002	4	0
	2001	4	0
	2000	4	0
Orem	2003	2.8	0
	2002	5	0
	2001	4	0
	2000	4	0
Cottonwood	2003	3.2	0
	2002	4	0
	2001	4	0
	2000	4	0

Note: 8-hour NAAQS = 9 ppm - Source: Utah Department of Environmental Quality, Division of Air Quality, 2004a.

Table 3.8-5: Ozone Air Quality Monitoring Data

Station	Year	Highest 8-Hour Value (ppm)	Number of Days of Exceedances above NAAQS Prior to March 2008 Revision
North Provo	2003	0.081	0
	2002	0.082	0
	2001	0.076	0
	2000	0.099	0
Herriman	2003	0.079	0
	2002	0.083	0
	2001	0.082	0
	2000	0.116	0
Cottonwood	2003	0.083	0
	2002	0.086	1
	2001	0.083	0
	2000	0.111	0

Note: Previous 8-hour NAAQS = 0.08 ppm, revised NAAQS = 0.075 ppm after March 2008. Compliance with the 8-hour ozone standard is based on the 3-year average of the 4th-highest daily maximum concentration measured at any monitor.

Source: Utah Department of Environmental Quality, Division of Air Quality, 2004a.

Table 3.8-6: PM₁₀ Air Quality Monitoring Data

Station	Parameter	2001	2002	2003	2004	2005
Salt Lake County						
Cottonwood (5715 South 1400 East, Holladay)	Annual average ($\mu\text{g}/\text{m}^3$) ^a	32	32	28	32	27
	Peak 24-hour value ($\mu\text{g}/\text{m}^3$) ^b	104	119	92	145	114
	Days above standard	0	0	0	0	0
Hawthorne (1675 South 600 East, Salt Lake City)	Annual average ($\mu\text{g}/\text{m}^3$)	30	29	26	29	24
	Peak 24-hour value ($\mu\text{g}/\text{m}^3$)	105	130	360	129	139
	Days above standard	0	0	2	0	0
Magna (2935 South 8560 West, Magna)	Annual average ($\mu\text{g}/\text{m}^3$)	25	25	26	24	22
	Peak 24-hour value ($\mu\text{g}/\text{m}^3$)	201	87	421	88	177
	Days above standard	2	0	1	0	1

Table 3.8-6: PM₁₀ Air Quality Monitoring Data - Continued

Station	Parameter	2001	2002	2003	2004	2005
North Salt Lake (1795 North 1000 West, Salt Lake City)	Annual average (µg/m ³)	44	41	40	42	37
	Peak 24-hour value (µg/m ³)	153	121	358	189	153
	Days above standard	0	0	3	1	0
Utah County						
Lindon (50 N. Main Street, Lindon)	Annual average (µg/m ³)	34	32	25	29	25
	Peak 24-hour value (µg/m ³)	111	288	150	159	86
	Days above standard	0	1	0	1	0
North Provo (1355 North 200 West, Provo)	Annual average (µg/m ³)	29	29	23	25	21
	Peak 24-hour value (µg/m ³)	95	82	76	100	68
	Days above standard	0	0	0	0	0

^a Annual PM₁₀ standard = 50 µg/m³ (annual standard revoked by EPA on December 18, 2006)

^b 24-hour PM₁₀ standard = 150 µg/m³ (standard allows for three exceedances over a 3-year period)

Source: U.S. Environmental Protection Agency 2007a

Table 3.8-7: PM_{2.5} Air Quality Monitoring Data

Station	Parameter	2001	2002	2003	2004	2005
Salt Lake County						
Cottonwood (5715 South 1400 East, Holladay)	Annual average (ppm) ^a	13.2	14.1	10.5	14.3	11.1
	Peak 24-hour value (ppm) ^b	77	84	57	69	63
	(98th percentile)	(68)	(65)	(32)	(66)	(42)
Herriman (5600 West 12950 South, Herriman)	Annual average (ppm)	13.3	8.3	7.0	10.9	7.8
	Peak 24-hour value (ppm)	69	60	28	62	40
	(98th percentile)	(69)	(38)	(25)	(48)	(27)
Hawthorne (1675 South 600 East, Salt Lake City)	Annual average (ppm)	12.4	12.7	9.6	14.2	11.0
	Peak 24-hour value (ppm)	81	90	60	94	61
	(98th percentile)	(66)	(56)	(34)	(64)	(43)
North Salt Lake (1795 North 1000 West, Salt Lake City)	Annual average (ppm)	14.1	15.5	12.3	17.8	14.1
	Peak 24-hour value (ppm)	67	92	55	86	63
	(98th percentile)	(58)	(56)	(46)	(57)	(44)
West Valley City (3275 West 3100 South, West Valley City)	Annual average (ppm)	12.9	13.4	11.1	13.9	12.0
	Peak 24-hour value (ppm)	67	86	55	74	63
	(98th percentile)	(60)	(58)	(45)	(61)	(40)

Table 3.8-7: PM_{2.5} Air Quality Monitoring Data - Continued

Station	Parameter	2001	2002	2003	2004	2005
Utah County						
Highland (10865 North 6000 West, Provo)	Annual average (ppm)	10.2	9.1	7.1	10.7	8.1
	Peak 24-hour value (ppm)	73	47	36	75	43
	(98th percentile)	(54)	(30)	(23)	(50)	(34)
Lindon (30 N. Main Street, Lindon)	Annual average (ppm)	11.6	10.9	8.6	12.8	10.0
	Peak 24-hour value (ppm)	78	66	61	82	60
	(98th percentile)	(61)	(43)	(29)	(64)	(37)
North Provo (1355 North 200 West, Provo)	Annual average (ppm)	11.8	11.6	9.2	11.1	9.8
	Peak 24-hour value (ppm)	83	58	42	67	46
	(98th percentile)	(49)	(40)	(28)	(54)	(36)

Notes: From 2001 to 2004, the 24-hour PM_{2.5} standard was 65 µg/m³. This was revised to 35 µg/m³ in 2005. Nearly all Wasatch Front monitoring sites in Salt Lake and Utah counties show a violation of the revised 24-hour PM_{2.5} standard.

^a Annual PM_{2.5} standard = 15 µg/m³

^b 24-hour PM_{2.5} standard = 35 µg/m³ (violations determined from 98th-percentile concentrations)

Source: U.S. Environmental Protection Agency 2007a

As noted above, the relative contribution of regional and localized sources to total ambient PM_{2.5} concentrations in the Wasatch Front is currently unclear. Although I-15 traffic volumes increased by more than 28% between 2000 and 2005, the annual-average PM₁₀ and PM_{2.5} concentrations steadily decreased during that same period (Table 3.8-6 and Table 3.8-7). This suggests that localized emissions from vehicle traffic may be only one of many contributors to overall PM₁₀ and PM_{2.5} concentrations.

3.8.2.3 Sensitive Receptor Locations

The I-15 corridor passes through a variety of land uses including urbanized areas and rural areas. In some cases, sensitive receptors are near the I-15 alignment. Section 3.2, Social, Demographics, and Community Cohesion, describes demographics near the alignment. Table 3.2-2, Schools and Libraries, lists the locations where school children are likely to be present.

3.8.3 Analysis Methodology for Air Quality Impact Assessment

The methodologies and results for the air quality analyses are summarized below.

3.8.3.1 Methodology for Transportation Conformity Analysis

Both regional and project-level air quality evaluations were used to verify the proposed I-15 project would conform to the approved SIP, as described below.

Regional Transportation Conformity Evaluation

The FHWA publication Transportation Conformity Reference Guide (2001) and the UDOT Environmental Process Manual of Instruction (2005) identify the requirements for evaluating potential air quality impacts associated with transportation projects and provide guidance on completing regional and project-level air quality evaluations.

Regional evaluations are conducted by the local MPOs in accordance with transportation conformity requirements. The MPO responsible for completing the regional evaluation in Salt Lake County is WFRC, while MAG is the MPO

responsible for assessments in Utah County. The most recent mesoscale evaluation for Salt Lake County is the Conformity Analysis for the WFRC 2030 Regional Transportation Plan (Wasatch Front Regional Council 2007). Similarly, MAG described its most recent regional air quality analysis in its document titled Draft Conformity Determination Report, Mountainland MPO, 2030 Regional Transportation Plan (2007).

Project-Level Carbon Monoxide Hot Spot Analysis

Project-level evaluations are related to localized air quality impacts, primarily at the roadway or intersection level. The CAL3QHC Line Source Dispersion Model (Version 2.0), which is the air quality dispersion model recommended by the EPA and UDOT for roadway projects, was used to complete the project-level CO hot spot analysis. This model was used to calculate peak 1-hour CO concentrations near selected interchanges and adjacent to the freeway mainline. The CO hot spot analysis was conducted as follows according to the UDOT Environmental Process Manual of Instruction and with consultation from UDOT air quality managers¹:

Peak-hour traffic volume and level of service forecasts for 93 project-influenced intersections were evaluated. Based on those comparisons, the following two heavily traveled and congested intersections associated with the project were selected for CO hot spot analysis:

- the intersection of Eastbay Boulevard with University Avenue in Provo, which is the most heavily congested and most heavily traveled signalized intersection associated with the project within the Provo/Orem CO maintenance area; and
- the signalized intersection and interchange at I-15 and 800 North in Orem, which is outside any CO maintenance areas but represents the most heavily traveled and most heavily congested intersection/interchange associated with the project.

The CAL3QHC dispersion model was used to estimate maximum 1-hour CO concentrations adjacent to each intersection and freeway mainline segment, using the CO emission factors specified by the UDOT Environmental Process Manual of Instruction. Maximum 8-hour impacts were estimated by multiplying the modeled 1-hour impacts by a 0.7 scale factor. Background concentrations of 6 ppm (1-hour) and 4 ppm (8-hour) were then added to the CAL3QHC values. These background values were selected because they were the highest measured CO concentrations in Salt Lake County and Utah County in 2004–2005.

Consultation for Qualitative Project-Level PM₁₀ Evaluation

The I-15 corridor is within PM₁₀ nonattainment areas in Salt Lake County and Utah County. A qualitative PM₁₀ evaluation was conducted according to the UDOT Environmental Process Manual of Instruction. Information on UDAQ's PM₁₀ modeling for the SIP was obtained through consultation with UDAQ; information on UDOT's road sanding and sweeping protocols was obtained through consultation with UDOT personnel². Information on emission budgets for primary fugitive dust and secondary PM₁₀ was obtained by consultation with MAG³. An updated qualitative PM₁₀ evaluation and project-level conformity determination for the preferred alternative will be prepared for the FEIS.

¹ Chaney, Jerry. Staff member, Utah Department of Transportation. April 6, 2007—Telephone conversation with James Wilder, Jones & Stokes.

² Barickman, Patrick. Staff member, Utah Department of Air Quality. April 26, 2007—Telephone conversation with James Wilder, Jones & Stokes.

³ Hardy, Susan. Staff member, Mountainland Association of Governments. April 6, 2007—Telephone conversation with James Wilder, Jones & Stokes.

3.8.3.2 Methodology for Regional Criteria Pollutant and Mobile Source Air Toxics Emission Evaluation

Regional emissions of MSATs were evaluated according to FHWA's methodology specified in its Interim Guidance on Air Toxic Analysis in NEPA Documents (2006). FHWA's Easy Mobile Inventory Tool (EMIT) model was used to estimate regional MSAT emissions from project-influenced roadways for 2001 baseline conditions and the 2030 design year for Alternative 4 (I-15 Widening and Reconstruction) and Alternative 1 (No Build). For this EIS analysis, FHWA specified that "project-influenced roadways" include all roadway segments in the region for which 2030 annual average daily traffic (AADT) volumes differ by more than 5% between Alternative 4 and Alternative 1. Forecast AADT traffic volumes for each project-influenced roadway segment were modeled as described in Chapter 2, Alternatives Considered. Roadways considered for the analysis include regional freeway segments, on-ramps and off-ramps, major and minor arterials, and urban connectors. The EMIT model uses the EPA's MOBILE6.2 model to develop factors for tailpipe emissions along each roadway segment. MOBILE6.2 input parameters were obtained from WFRC and MAG.

3.8.4 *Alternative 1- No Build*

3.8.4.1 Nationwide MSAT Emission Reduction Trends

As described previously, for its MSAT rules, the EPA examined the benefits of existing and newly promulgated mobile source control programs, including its RFG program, NLEV standards, Tier 2 motor vehicle emissions standards and gasoline sulfur control requirements, and proposed heavy duty engine and vehicle standards and on-highway diesel fuel sulfur control requirements. Figure 3.8-2 shows FHWA's forecasted trends in nationwide tailpipe emissions (FHWA 2006). Between 2000 and 2020, even with a 64% increase in nationwide VMT, FHWA projects that these programs will reduce nationwide on-highway emissions of benzene, formaldehyde, 1,3-butadiene, and acetaldehyde by 67% to 76%. In addition, it will reduce nationwide highway DPM emissions by 90%.

As described in the following section, the nationwide trend of improvement in MSAT emissions is also expected to apply within the I-15 regional study area. Compared to 2001 baseline conditions, regional vehicle travel is forecasted to increase, but regional MSAT emissions are forecasted to decrease.

Unavailable Information for Project-Specific MSAT Impact Analysis

This section includes a basic analysis of the likely MSAT emission impacts associated with the proposed project. The available technical tools do not allow FHWA and UDOT to predict the project-specific health impacts of the MSAT emissions associated with the project. Because of these limitations, the following discussion is included in accordance with the regulations of the Council on Environmental Quality (40 CFR 1502.22[b]) regarding incomplete or unavailable information.

Information That Is Unavailable or Incomplete

Evaluating the environmental and health impacts of MSATs from a proposed highway project would involve several key elements, including emissions modeling, dispersion modeling to estimate ambient concentrations resulting from the estimated emissions, exposure modeling to estimate human exposure to the estimated concentrations, and a final determination of health impacts based on the estimated exposure. Each of these steps is limited by technical shortcomings or scientific uncertainty that prevents a more complete determination of the health impacts of MSATs from the project.

Emissions. The EPA tools for estimating MSAT emissions from motor vehicles are not sensitive to key variables needed to determine the emissions from highway projects. Although the MOBILE6.2 model is used to predict emissions at a regional level, it has limited applicability at the project level. MOBILE6.2 emission factors are based on a typical trip length of about 7.5 miles, with average speeds for such typical trips. As a result, MOBILE6.2 does not have the ability to predict emission rates for a specific vehicle operating condition at a specific location at a specific time. Because of this limitation, MOBILE6.2 can only approximate the operating speeds and levels of congestion likely to contribute to emissions on a regional scale, and cannot adequately capture the emissions effects

of specific projects. In its discussions of particulate matter under the conformity rule, EPA has identified problems with MOBILE6.2 as a general impediment to quantitative analysis.

These deficiencies compromise the ability of MOBILE6.2 to accurately estimate MSAT emissions. MOBILE6.2 is an adequate tool for projecting emission trends and performing relative analyses between alternatives for very large projects, but it is not sensitive enough to capture the effects of travel changes tied to smaller projects or to predict emissions near specific roadside locations.

Dispersion. The tools to predict how MSATs disperse in the environment are also limited. Current regulatory models (e.g., CAL3QHC) were developed and validated more than 10 years ago for predicting episodic concentrations of CO to determine compliance with the NAAQS.

The performance of dispersion models is more accurate for predicting maximum concentrations that can occur at a specific time and location in a geographic area. This limitation makes it difficult to predict accurate exposure patterns at specific times at specific highway project locations across an urban area to assess the potential health risk. The National Cooperative Highway Research Program is conducting research on best practices in applying models and other technical methods to assist in the analysis of MSATs. This work also will focus on identifying appropriate methods of documenting and communicating MSAT impacts in the NEPA process and to the general public. Along with these general limitations of dispersion models, there is also a lack of monitoring data in most areas for use in establishing project-specific MSAT background concentrations.

Exposure Levels and Health Effects. Finally, even if emission levels and concentrations of MSATs could be predicted accurately, limitations in current techniques for exposure assessment and risk analysis prevent FHWA from reaching meaningful conclusions about project-specific health impacts. Exposure assessments are difficult because it is difficult to accurately calculate annual concentrations of MSATs near roads and then determine the portion of a year that people are actually exposed to those concentrations at a specific location. These difficulties are compounded for determining 70-year cancer assessments, especially because unsupportable assumptions would have to be made regarding changes in travel patterns and vehicle technology (which affects emissions rates) over a 70-year period. There are also considerable uncertainties associated with the existing estimates of toxicity of the various MSATs because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population. Because of these shortcomings, any calculated difference in health impacts between alternatives is likely to be much smaller than the uncertainties associated with calculating the impacts. Consequently, the results of such assessments would not be useful to decision-makers, who would need to weigh this information against other project impacts that are better suited for quantitative analysis.

Summary of Existing Credible Scientific Evidence Relevant to Evaluating the Impacts of MSATs

Research into the health impacts of MSATs is ongoing. For different emissions, there are a variety of studies indicating that some emissions are either statistically associated with adverse health outcomes (frequently based on emission levels found in occupational settings) or indicating that laboratory animals demonstrate adverse health outcomes when exposed to large doses.

Exposure to air toxics has been the focus of a number of EPA efforts. Most notably, the agency conducted the National Air Toxics Assessment (NATA) in 1996 to evaluate modeled estimates of human exposure applicable at the county level. While they were not intended for use as a measure of or benchmark for local exposure, the modeled estimates in the NATA database best illustrate the levels of various toxics when aggregated to a state or national level.

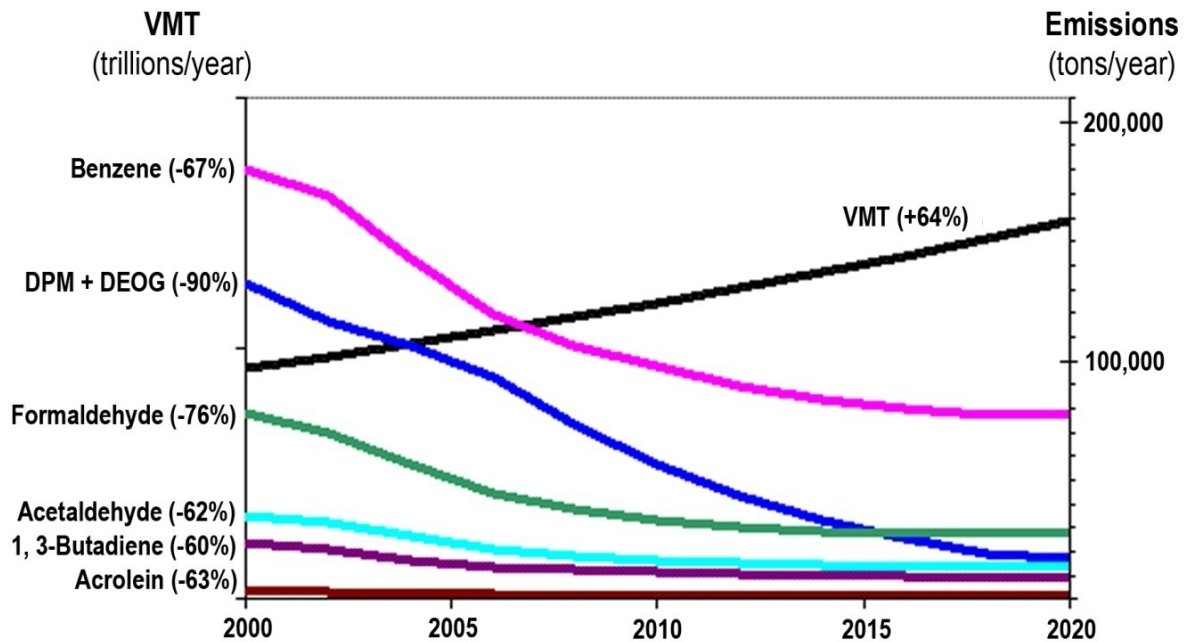
EPA is in the process of assessing the risks of various kinds of exposures to these pollutants. The EPA Integrated Risk Information System (IRIS) is a database of human health effects that could result from exposure to various substances found in the environment. Other studies address MSAT health impacts in proximity to roadways. The Health Effects Institute, a non-profit organization funded by EPA, FHWA, and industry, has undertaken a major series of studies to research near-roadway MSAT hot spots, the health implications of the entire mix of mobile-source pollutants, and other topics. The final summary of the series is not expected for several years. A workshop

sponsored by the Johns Hopkins School of Public Health (2004) concluded that residences close to roadways with high traffic density are associated with an increased risk of a broad spectrum of health outcomes in adults and children, including mortality, lung function, and lung cancer in adults, as well as respiratory symptoms including asthma/wheezing and lung function in children. Recent studies also support a finding of increased risk from exposure in proximity to transportation facilities. Two recent studies (McConnell et al. 2006; Gauderman et al. 2007) observed a statistically significant association of increasing childhood asthma rates with decreasing distance to freeways in several California towns. A recent study (ICF International 2007) summarizes information and guidelines on available analytical models and techniques to assess MSAT impacts and how such information can be communicated in the environmental process.

Relevance of Unavailable or Incomplete Information to Evaluating Reasonably Foreseeable Significant Adverse Impacts on the Environment, and Evaluation of Impacts Based on Theoretical Approaches or Research Methods Generally Accepted in the Scientific Community

Because of the uncertainties discussed above, a quantitative assessment of the effects of air toxic emissions impacts on human health cannot be made at the project level. Although available tools do allow FHWA to reasonably predict relative emission changes between alternatives for large projects, the amount of MSAT emissions from each of the project alternatives and MSAT concentrations or exposures created by each of the project alternatives cannot be predicted with enough accuracy to be useful in estimating health impacts. (As noted above, the current emissions model is not capable of serving as a meaningful emissions analysis tool for specific projects.) Therefore, the relevance of the unavailable or incomplete information is that it is not possible to determine whether the I-15 project would have “significant adverse impacts on the human environment.”

Figure 3.8-2: Benefits of the EPA's Nationwide MSAT Regulations



Source: FHWA 2006.

3.8.4.2 Regional Tailpipe Emissions

The nationwide trend of steadily improving tailpipe emissions is forecasted to occur within the I-15 regional air quality study area for all project alternatives. The regional air quality study area was defined for this EIS to include all project-influenced roadways (defined as roadway segments in Salt Lake County and Utah County that will experience a 5% deviation in 2030 AADT between Alternative 1 (No-Build) and Alternative 4 (Preferred Alternative). Traffic volumes along I-15 and other regional roadways would increase by the 2030 design year as a result of regional population growth, as described in Chapter 1, Purpose and Need. However, those traffic volume increases will be more than offset by reductions in tailpipe emissions from individual cars as a result of EPA rules. FHWA's EMIT model and the EPA's MOBILE6.2 model were used to estimate regional tailpipe emissions along project-influenced regional roadways. Table 3.8-8 lists the estimated regional emissions for criteria air pollutants, carbon dioxide, and MSATs for the 2005 baseline year and the 2030 design year No Build and Preferred Alternative. The year 2005 was used as the baseline year for this analysis, because it is the most recent year for which the WFRC/MAG Regional Travel Demand Version 5 traffic model was calibrated against WFRC and MAG data.

As listed in the Net Change columns of Table 3.8-8, daily vehicle travel along the project-influenced roadways would increase under Alternative 1 between 2001 and 2030. Also, as listed in the Net Change columns, regional traffic volumes are expected to increase by 130% compared to the 2001 baseline conditions. Regardless, the regional emissions of criteria pollutants are forecasted to decrease during that period. Further, as listed in the Net Change columns, the regional emissions of criteria pollutants for Alternative 1 conditions would decrease by 10% to 74% compared to 2005 baseline values. Similarly, regional emissions of MSATs are forecasted to decrease under Alternative 1, with 2030 regional emissions decreasing by 26% to 91% compared to their 2005 baseline values.

Table 3.8-8: Regional Emissions on Project-Influenced Roadways

Pollutant	Total Emissions (Tons per Year)			Net Change (2030 Design Year Compared to 2005 Baseline)		
	2005 Baseline	2030 Alt. 1 No-Build	2030 Alt. 4 Preferred Alternative*	2030 Preferred Alternative Minus 2005 Baseline	2030 No-Build Minus 2005 Baseline	2030 Preferred Alternative Minus 2030 No-Build
Vehicle Miles Traveled per Day	6,157,000	11,810,000	12,614,000	105%	92%	7%
Mobile Source Air Toxics						
Acetaldehyde	14.05	10.42	10.91	-22%	-26%	5%
Acrolein	1.87	1.31	1.37	-27%	-30%	5%
Benzene	75.09	51.84	54.63	-27%	-31%	5%
1,3-Butadiene	10.28	7.12	7.52	-27%	-31%	6%
Diesel Particulate Matter (DPM)	69.99	6.33	6.76	-90%	-91%	7%
Formaldehyde	45.67	31.07	32.56	-29%	-32%	5%
Criteria Air Pollutants and Greenhouse Gases						
CO	56,810	50,971	55,174	-3%	-10%	8%
Carbon Dioxide (CO ₂)	1,014,783	1,384,784	1,493,318	47%	36%	8%
PM ₁₀ (tailpipes, brakes, tire wear)	2,731	1,747	1,821	-33%	-36%	4%
PM _{2.5} (tailpipes, brakes, tire wear)	6,519	1,923	2,086	-68%	-70%	8%
VOC	146	131	140	-4%	-10%	7%
NO _x	103	61	65	-37%	-41%	7%
SO ₂	227	439	469	107%	93%	7%

*Values provided are for the Preferred Alternative. Other design configurations would produce only negligible changes as VMT vary slightly.

Note: Listed values apply only to project-influenced roadways

Source: Jones & Stokes 2008

3.8.4.3 Local Ambient Air Pollutant Concentrations for Alternative 1

Under Alternative 1, I-15 widening and reconstruction would not occur, but ongoing routine improvements, such as bridge and pavement projects will occur. Traffic volumes on I-15 would increase, but the future increase in traffic volume would likely be more than offset by reductions in tailpipe emissions from individual vehicles as a result of the EPA's ongoing mobile source emission regulations. Therefore, future ambient air pollutant concentrations near I-15 and its interchanges are anticipated to be similar to or less than current levels.

3.8.5 Alternative 4: I-15 Widening and Reconstruction

3.8.5.1 Regional Conformity with State Implementation Plan

This section provides a qualitative discussion of the pollutants of concern based primarily on the regional conformity analyses completed for the WFRC and MAG long-range transportation plans, including the proposed project. WFRC's and MAG's most recent conformity analyses were both completed in 2007

Carbon Monoxide

Most of Alternative 4 is located in an attainment area for CO. However, the southernmost portion of the project is within the Provo CO maintenance area, and the northern terminus is near (but not within) the Salt Lake City CO maintenance area. Although most regional CO emissions can be attributed to motor vehicles, CO emissions can also result from industrial and natural processes such as metals processing, wood stoves, and forest fires. Substantial changes in other emission sources combined with changes in travel patterns and transportation networks might affect CO emissions at a regional level, but the effects of any individual project are likely to be small (Utah Department of Transportation 2003c).

The only CO maintenance area in MAG's jurisdiction is the City of Provo. The MAG's most recent air quality conformity analysis for its long-range transportation plan (which included this project) estimated CO emissions for the transportation network within the Provo CO maintenance area for the period 2014–2030, and demonstrated that CO emissions in the city would be much less than the allowable CO emission budgets specified by the SIP (Mountainland Association of Governments 2007). Specifically, Provo transportation CO emissions are forecasted to be 28.63 tons per day in 2030, compared to the allowable emission budget of 72.1 tons per day.

The only CO maintenance area in Salt Lake County is the Salt Lake City metropolitan area, which is beyond the I-15 widening project's northern terminus. WFRC's most recent air quality conformity analysis for its long-range transportation plan (which included this project) estimated CO emissions for the entire transportation network within the Salt Lake City maintenance area, and demonstrated that CO emissions in the city would be much less than the allowable CO emission budgets specified by the SIP (Wasatch Front Regional Council 2007). Specifically, Salt Lake City transportation CO emissions are forecasted to be 100.06 tons per day in 2030, compared to the allowable emission budget of 279 tons per day.

Particulate Matter (PM₁₀)

Salt Lake County and Utah County are nonattainment areas for PM₁₀, as previously discussed. However, measured PM₁₀ concentrations in the two counties have decreased since 1993, and exceedances of the PM₁₀ NAAQS have become rare since the early 1990s (Utah Department of Environmental Quality, Division of Air Quality, 2007). Based on the PM₁₀ monitoring data, UDAQ has petitioned the EPA to redesignate the two counties to PM₁₀ maintenance areas. Regional characteristics play an important role in PM₁₀ levels in Utah. The state's climate and geography influence regional PM₁₀ impacts when temperature inversions cause particles to become trapped in the valleys. Meteorological conditions combined with changes in regional land use and transportation patterns might affect PM₁₀ at a regional level, but the effects of any individual project are likely to be small (Utah Department of Transportation 2003c).

WFRC's most recent air quality conformity analysis for its long-range transportation plan (which included this project) estimated PM₁₀ emissions for the entire transportation network within Salt Lake County, and demonstrated that PM₁₀ emissions in the county would be less than the allowable transportation-related PM₁₀ emission budgets specified by the SIP (Wasatch Front Regional Council 2007). Specifically, countywide transportation-related primary PM₁₀ emissions are forecasted to be 35.18 tons per day in 2030, compared to the allowable emission budget of 40.4 tons per day. County-wide NO_x precursor emissions (related to secondary PM₁₀) are forecast to be 11.43 tons per day in 2030, well below the allowable emission budget of 32.3 tons per day.

MAG's most recent air quality conformity analysis for its long-range transportation plan (which included this project) estimated PM₁₀ emissions for the entire transportation network within Utah County for the period 2010–2030, and demonstrated the countywide PM₁₀ emissions would be less than the allowable emission budgets specified by the SIP (Mountainland Association of Governments 2007). Specifically, countywide transportation PM₁₀ emissions are forecasted to be 15.04 tons per day in 2010, compared to the allowable emission budget of 20.5 tons per day. (Note: Most of the PM₁₀ emissions in that planning year are forecasted to be gaseous PM₁₀ precursors that react in the atmosphere to form PM₁₀ several miles downwind of the sources, while only a fraction of the PM₁₀ emissions are particulate matter emitted directly from sources as fugitive dust, brake wear, or tailpipe emissions.)

As noted above, the relative contribution of regional and localized sources to total ambient PM₁₀ concentrations in the Wasatch Front is currently unclear. However, it is worth noting that although traffic volumes on I-15 increased by more than 28% between 2000 and 2005, the annual-average PM₁₀ concentrations listed in Table 3.8-6 generally decreased during this period. This suggests that localized emissions from vehicle traffic may be only one of many contributors to overall PM₁₀ concentrations.

Future Conformity Issues Related to PM_{2.5}

Although the contribution of localized sources of PM_{2.5} may be minor, construction of Alternative 4 would likely result in some increase in localized PM_{2.5} concentrations along the I-15 alignment compared to Alternative 1. Changes in travel speeds could also have an impact on PM_{2.5} emissions. While the EPA's MOBILE6.2 model does not predict how particulate matter emission rates change with speed, it is reasonable to assume that to the extent congestion relief provided by the I-15 widening project would reduce stop-and-go traffic conditions and vehicle idling, it would also reduce PM_{2.5} tailpipe emissions on the affected roadways. Also, in cases where I-15 improvements reduce traffic volumes on arterial roadways with signalized intersections, PM_{2.5} tailpipe emissions from vehicle idling at those intersections would also be reduced. It is uncertain how reducing congestion (and thereby increasing vehicle speed) would affect fugitive dust emissions of PM_{2.5}.

Motor vehicle emission rates are expected to decline between 2005 and the expected opening year of the project, with an additional reduction between 2015 and 2030. The EPA's transportation conformity guidance places special emphasis on emissions from diesel vehicles, and the expected emission reductions from diesel vehicles are even greater. The EPA's MOBILE6.2 model predicts that relative to 2005, nationwide diesel particulate emissions rates will decline by 80% by 2015 and 95% by 2030; in other words, 100,000 nationwide vehicles in 2005 would have the same diesel particulate emissions as 500,000 nationwide vehicles in 2015 or 2,000,000 vehicles in 2030. Similarly, the regional emission analyses presented earlier in this section demonstrated regional emissions of NO_x (the main precursor of secondary PM_{2.5}) are forecast to steadily decline in the future. That decline in precursor emissions would likely result in corresponding declines in secondary PM_{2.5} ambient concentrations.

Future Conformity Issues Related to Ozone Precursors (NO_x and VOCs)

The Wasatch Front region has been in attainment with ozone standards since EPA revoked the 1-hour standard in 2005 (the region has always complied with the 8-hour ozone standard). On March 12, 2008, EPA completed a rule making process that revised the 8-hour ozone standard downward. Recent measured ozone concentrations exceed the new 8-hour NAAQS in the Wasatch Front counties, so it is likely the urbanized portions of Salt Lake County and Utah County will be re-designated as ozone nonattainment areas by 2010 (Bob Clark personal communication). Transportation Conformity requirements for the new ozone nonattainment areas will take effect starting as early as 2012. The NEPA process for the I-15 project is expected to be completed before that date, so for this EIS the Transportation Conformity assessment assumes the project is within a current ozone attainment area.

Because the Wasatch Front is currently an attainment area for ozone, the most recent conformity analyses prepared by WFRC and MAG have not tracked ozone precursors. WFRC's last conformity analysis for ozone precursors was completed as part of the regional transportation conformity analysis in December 2003. That study estimated emissions of O₃ precursors (NO_x and VOCs) for the entire transportation network (including I-15) within Salt Lake

County for the period 2004–2030, and demonstrated that countywide emissions for that period would be less than the allowable transportation-related emission budgets specified by the SIP. Specifically, countywide transportation NO_x emissions were forecast to be 38.4 tons per day in 2020, compared to the allowable emission budget of 85.6 tons per day. Similarly, countywide transportation VOC emissions were forecast to be 31.1 tons per day in 2020, compared to the allowable emission budget of 58.7 tons per day.

3.8.5.2 Project-Level Carbon Monoxide Hot Spot Analysis

A project-level impact analysis was completed for the following locations, representing the I-15 mainline and two of the most heavily traveled or congested signalized project-influenced intersections:

- Eastbay Boulevard and University Avenue in Provo, which is within the Provo CO maintenance area; and
- I-15 ramps at 800 North in Orem, which is the most heavily traveled and congested intersection outside the CO nonattainment area.

Impact Criteria

An air quality impact would occur if the CO hot spot analysis for Alternative 4 indicated that modeled future CO concentrations at any receptor exceeded either the 1- or 8-hour NAAQS limits (35 ppm and 9 ppm, respectively).

Modeling Results

Table 3.8-9 summarizes the highest modeled CO concentrations (including background) at any receptor location at each subject intersection for 2006 existing conditions and the 2030 design year conditions. The quantitative analysis used the CAL3QHC model to predict worst-case CO concentrations for the existing conditions (2006) and the design year (2030). The modeled values for 2030 are lower than the values for the existing conditions because the regional vehicle fleet is becoming more clean-burning at a faster rate than traffic volumes are increasing. It is recognized that modeled CO concentrations during intermediate “build years” could be higher than either the existing or design year conditions. However, at this time, the specific schedule for constructing the various portions of the proposed project is undetermined, so UDOT has not attempted to develop detailed traffic volume or LOS analyses for each intersection for various intermediate build years. Based on that lack of detailed traffic modeling data, the CO hot spot analysis did not include modeling of intermediate build years.

Table 3.8-9: Carbon Monoxide Hot Spot Modeling Results

Modeled Year	Alternative 1 No-Build		Alternative 4 Preferred Alternative		NAAQS	
	1-Hour (ppm)	8-Hour (ppm)	1-Hour (ppm)	8-Hour (ppm)	1-Hour (ppm)	8-Hour (ppm)
Eastbay Boulevard at University Avenue						
Existing Year (2006)	10.0	6.8	NA	NA	35	9
Design Year (2030)	8.2	5.5	8.5	5.8	35	9
I-15 at 800 North, Orem						
Existing Year (2006)	10.3	7.0	NA	NA	35	9
Design Year (2030)	8.6	5.8	8.5	5.8	35	9

Note: Listed values include background (6 ppm 1-hour and 4 ppm 8-hour, monitored data)

Source: Jones & Stokes 2008

The CO hot spot analysis indicated the following for Alternative 1:

- For 2006 existing conditions, no CO exceedances were modeled at any of the subject intersections.
- For the 2030 design year, no CO exceedances were modeled at any of the subject intersections, and CO concentrations would be less than 2006 existing conditions.

The CO hot spot analysis indicated the following for Alternative 4:

- For the 2030 design year, no CO exceedances were modeled at any of the subject intersections.
- In all cases, the modeled CO concentrations for the 2030 design year were less than 2006 existing conditions. In some cases, the modeled 2030 concentrations for the Preferred Alternative exceeded those for 2030 No-Build, but both are well below the NAAQS.

3.8.5.3 Qualitative Project-Level PM₁₀ Assessment

The following discussion in this subsection is a qualitative assessment of the localized PM₁₀ hot spot impacts for the Preferred Alternative. Although the project will increase traffic volumes by roughly 7% compared to the No-Build Alternative, it is unlikely that windblown dust generated by construction or traffic on I-15 would cause PM₁₀ concentrations near the freeway to exceed the NAAQS. As listed in Table 3.8-6, there are numerous PM₁₀ monitoring stations in the general vicinity of I-15. Measured PM₁₀ concentrations have generally been well below the NAAQS. The highest PM₁₀ concentrations have been measured at the North Salt Lake City monitoring station, which is in an industrial zone adjacent to a major surface mining operation. This is the closest monitored station to a freeway in the Wasatch Front. The measured PM₁₀ concentrations at that monitoring station were likely impacted more by local emissions from the adjacent industrial zones than by vehicular emissions from I-15.

UDAQ air quality regulations will require construction contractors to minimize PM₁₀ emissions during construction. Construction operations would temporarily increase fugitive dust and construction equipment tailpipe emissions. However, UDAQ Rule 307-309 (Fugitive Emissions and Fugitive Dust) requires construction crews to implement a dust control plan to minimize windblown dust and trackout of mud onto public roads. UDOT's standard design specification to comply with this dust control regulation is described in Section 3.8.6. UDOT generally uses salt, not sand, to control ice accumulation on I-15 during winter.⁴ Therefore, silt loadings are minimized along I-15 during winter and spring, when PM₁₀ concentrations are generally highest, which reduces fugitive dust emissions and ambient PM₁₀ concentrations beyond the freeway right-of-way.

Ambient PM₁₀ concentrations in Salt Lake County and Utah County are caused mainly by secondary particulates generated in the atmosphere by gaseous tailpipe emissions, rather than by windblown primary particulates.^{5,6} PM₁₀ modeling conducted for the SIP accounted for emissions from I-15 and all other sources in the counties. The SIP for PM₁₀ established transportation emission budgets for both primary particulate and gaseous PM₁₀ precursors in Salt Lake County and Utah County. The most recent transportation conformity determinations for both counties demonstrated that forecasted emissions of primary windblown dust from roadway projects for the period 2010–2030 are less than the allowable emission budgets set by the SIP (Wasatch Front Regional Council 2006; Mountainland Association of Governments 2007).

⁴ Chaney, Jerry. Staff member, Utah Department of Transportation. April 6, 2007—Telephone conversation with James Wilder, Jones & Stokes.

⁵ Hardy, Susan. Staff member, Mountainland Association of Governments. April 6, 2007—Telephone conversation with James Wilder, Jones & Stokes.

⁶ Barickman, Patrick. Staff member, Utah Department of Air Quality April 26, 2007— Telephone conversation with James Wilder, Jones & Stokes.

3.8.5.4 Qualitative PM_{2.5} Hot-Spot Evaluation

With respect to localized PM_{2.5} hot-spot impacts, the qualitative PM₁₀ hot-spot analysis performed for this document provides some insight about likely PM_{2.5} impacts as well. Many of the emission sources that emit PM₁₀ also contribute in varying degrees to elevated PM_{2.5} concentrations as well; practically all PM₁₀ vehicle exhaust and nitrate particles formed from gaseous NO_x emissions are in the PM_{2.5} and smaller size range, while only a small fraction of brake wear, tire wear, and road dust are in that range. As listed in Table 3.8-8, the Preferred Alternative would result in a slight increase in primary PM_{2.5} emissions (tailpipe soot, road dust, tire wear and break wear) compared to the No Build Alternative. However, a large decline in tailpipe emissions (including NO_x, the main secondary PM_{2.5} precursor) is projected between the 2005 baseline year and the project design year, which will contribute to reduced concentrations of secondary PM_{2.5}. Since most PM_{2.5} in the region is known to consist of secondary PM_{2.5} (Hardy 2007), it is expected that overall PM_{2.5} concentrations caused by vehicular emissions will likely decrease in the future.

3.8.5.5 Regional Trends in Criteria Pollutant and MSAT Emissions

Regional vehicle traffic volumes and regional tailpipe emissions will increase under Alternative 4 compared to Alternative 1, but Alternative 4 regional tailpipe emissions for the 2030 design year are forecasted to be less than 2001 baseline emissions. Table 3.8-8 shows the results of EMIT tailpipe emission modeling for the regional network of project-influenced roadways. As listed in the Net Change columns, daily vehicle travel for Alternative 4 (Preferred Alternative) in 2030 is forecasted to increase by 105%% compared to 2005 baseline conditions, and increase by 7% compared to Alternative 1 (No-Build) conditions. Also, as listed in the Net Change columns, by 2030 the regional criteria pollutant and MSAT emissions for Alternative 4 (Preferred Alternative) would increase by 4% to 8% compared to Alternative 1 (No-Build) conditions. However, increases in VMT between 2001 and 2030 would be more than offset by the steady improvement in emissions from individual vehicles. Therefore, as listed in the Net Change columns, regional MSAT emissions for Alternative 4 (Preferred Alternative) would decrease by 22% to 90%% compared to 2005 baseline values.

3.8.5.6 Nitrogen Dioxide, Sulfur Dioxide, and Lead

There are currently no nonattainment or maintenance areas for NO₂, SO₂, or lead in the study area. Because of their regional nature and the minimal contribution of motor vehicles as a source of these pollutants, it is unlikely that the proposed action would substantially affect concentrations of these pollutants in the study area.

Before about 1990, airborne lead emissions from tailpipes were deposited onto the ground near roadways throughout the United States, including I-15. After leaded gasoline was phased out, lead deposition onto roadways became less of an issue. Regardless, lead concentrations in surface soil near the freeway could be higher than background concentrations, and it is theoretically possible that historically deposited lead on the ground within the I-15 right-of-way could become re-suspended during roadway construction. However, the stringent fugitive dust control measures that will be required by UDOT during construction will ensure that ambient airborne lead concentrations near the construction zones will not approach federal and state air quality limits.

3.8.5.7 Comparison of Design Options

The air quality impacts for Provo/Orem Options B, C and D would be similar to those for Option A. The regional VMT for each option would be similar to Provo/Orem Option A, so the regional tailpipe emissions would also be similar for all options. Therefore, the mesoscale analysis for Option A would also apply for the other design options.

The localized CO hot-spot impacts would be nearly the same for all design options, and in all cases the worst-case CO impacts would be less than the NAAQS. A detailed modeling analysis was done for Option A, and the hot-spot impacts for the other design options were estimated by scaling from the Option A results according to the forecast traffic volumes. The localized CO hot-spot analysis for Provo/Orem Option A was done by conducting CAL3QHC modeling for two of the most heavily traveled and heavily congested intersections within the project area. The hot-

spot impacts at those two intersections for Provo/Orem Option A showed no significant impacts. One of those intersections was Eastbay Boulevard at University Avenue, inside the Provo CO maintenance area. As described in Chapter 2, the Average Annual Daily Traffic (AADT) volumes for the roadway link that includes that intersection differ slightly between the design options. The forecast 2030 AADT for Option A and Option B is the same. The forecast AADT for Options C and D is 4% higher than Option A. Based on those AADT forecasts, the CO hot spot results for Options C and D were estimating by increasing the modeled CO hot-spot increment by 4%. As shown in Table 3.8-10 the estimated CO hot-spot impacts for all design options are lower than the NAAQS.

Table 3.8-10: CO Hot-Spot Analysis for Design Options
for Eastbay Boulevard at University Avenue

	1-Hour CO (ppm)	8-Hour CO(ppm)
Option A (using CAL3QHC)	9	6
Option B (same AADT as Option A)	9	6
Option C (AADT 4% higher than Option A)	9	6
Option C (AADT 4% higher than Option A)	9	6
NAAQS	35	9

Note: Listed concentrations include background values (6 ppm for 1-hour and 4 ppm for 8-hour)

The air quality impacts are expected to be similar for American Fork Options A, B, and C. None of the American Fork intersections associated with the design options would have 2030 traffic volumes or LOS high enough to be selected for the worst-case CO hot-spot modeling. Therefore, it is unlikely that slight variations in future traffic volumes for the design options would cause the CO hot-spot impacts in American Fork to exceed the NAAQS.

3.8.6 Mitigation

The analysis presented in Section 3.8 does not indicate that significant air quality impacts will result from implementing the Preferred Alternative. Therefore, no air quality mitigation measures (other than compliance with applicable regulations) are warranted. To minimize fugitive dust during construction activities, as required by UDAQ Rule 307-309 (Fugitive Emissions and Fugitive Dust), the UDOT Specification Section 01572, (Dust Control and Watering) will be included in the project construction plans and design specifications. The contractor will also adhere to any local ordinances, if applicable.

3.8.7 Transportation Conformity

As noted above, USDOT is required to make a project-level conformity determination before approving this project. A draft conformity determination will be completed for the FEIS for this project, with a final conformity determination being made as part of the Record of Decision.